INTRODUCTION

Fine Needle Aspiration for head and neck mass was first reported in 1847 by Kun. However Fine Needle Aspiration Cytology was pioneered by Martin in the early 1930's. [1]

Head and neck region account for approximately more than a half of all body sites being subjected to FNAC; this fact is forming a base to perform this study. The large number of head and neck aspirates reflects the high incidence of pathologies occurring in this site in our country.

FNAC is of great value in head and neck region, because of multiplicity of accessible organs and heterogeneous pathologies encountered. Head and neck masses comprise of lesions commonly arising from lymph nodes, thyroid, salivary gland, soft tissues & other sites like skin or sub cutis of the face, pinna, external nose, reachable nasal cavity, floor of mouth, tongue, palate, tonsils, and the posterior pharyngeal wall. [2]

The lesions range from inflammation to neoplasia which include both benign and malignant, the latter further classified as primary or secondary. Whether or not the history and the physical examination strongly suggest a specific diagnosis, the information obtained by sampling tissue from the swelling is often highly useful. Imaging diagnosis has low specificity for differentiating benign from malignant lesions in Head and Neck region.[3]

FNAC is a technique that has comparative good patient compliance, is inexpensive, quick to do, allow more rapid diagnosis &re-aspiration can be done quickly at the time of initial testing.An important aspect of FNAC is avoidance of surgery in situations like non neoplastic/inflammatory conditions and metastatic tumours;also it allows an early differentiation of benign from malignant pathology which greatly influences the further management strategy.

However there are many factors that affect the outcome of FNAC. These are the technique of aspiration, the experience of the person who performs it, size of mass, depth of swelling, site of the lesion, use of image guidance, proximity to important structures, vascularity of lump and the expertise of the interpreter.[4]FNAC technique also has disadvantages which include high rate of non-diagnostic samples.

AIMS AND OBJECTIVES

1. To assess the diagnostic accuracy of head and neck swelling FNAC's in our hospital;{in terms of true positive (specificity), true negative (sensitivity), falsepositive, false negative values} considering histopathological results as the gold standard.

2. To ascertain common cause of unsatisfactory and nondiagnostic smears &try to modify the errors.

4. To identify common pitfalls & causes of misinterpretation of the cytological diagnosis leading to discordant results.

5. To determine the common aetiologies of head and neck swelling in our set up& correlate it with demographic factors.

6. To build a more close cooperation between the surgeon, the radiologist & pathologist for an overall better patient management.

REVIEW OF LITERATURE

Differential diagnoses of head/neck masses

1. **Nonneoplastic**

- Infective/ Inflammatory- Abscess, Tuberculosis or atypical mycobacterium, Lymphadenitis, Infectious mononucleosis, Cat scratch disease, etc.
- Congenital
    - Lateral neck- Brachial cleft cysts, Cystic hygroma, Dermoid cyst
    - Medial neck- Thyroglossal duct cyst
- Thyroid- Goiter, Thyroiditis, Hyperplasia, etc.
- Salivary gland lesions- Cyst, Sialedinitis/sialolithiasis, Sjogren's syndrome, lymphoepithelial lesion, etc.
- Miscellaneous- Sarcoidosis, Kimura's disease, Castleman's disease, Thymic cyst, etc.

2. **Benign**

- Soft tissue mass- Paraganglioma, Lipoma, Neurofibroma, Neurilemmoma
- Vascular abnormalities- Hemangioma, Lymphangioma
- Thyroid & salivary gland neoplasms

3. **Malignant**

- Primary neck tumors- Thyroid malignancy, Lymphoma, Salivary gland malignancy, Sarcomas
- Metastatic- Squamous cell carcinoma (SCC), Adenocarcinoma (most commonly from salivary gland origin), all other primary sites imaginable.

Common errors in diagnosis by fine-needle aspiration (FNA)are:

- Technical error

- Aspirating a mass without moving the needle back and forth through the specimen (to dislodge the cells).
- Inappropriate operator's skill in performing and processing
- Syringe not creating good negative pressure. Maintaining negative suction while withdrawing the needle;aspirated tissue is then sucked into the syringe.Use of excessive suction increases blood in aspirate and may traumatise the tissue.
- Deviation of needles due to tissue planes or tough capsules on lesions.
- Inappropriate gauge of needle used.
- Insufficient material due to less number of passes made.
- Air-drying is one of the most common technical problems.

➢ Interpretation error

- Lack of experience of Pathologist in interpreting
- Pathologists issuing diagnoses on samples with inadequate material

➢ Bias: Pathologist bias, augmented by the clinician's opinion.

➢ Others

- Collection of necrotic, cystic, hemorrhagic and/or fibrotic specimens
- Patient's tolerance level

Lymph Nodes

Usefulness of FNAC in lymph node swellings

- ➢ The most important role for FNA is to decide whether the enlarged lymph node needs to be excised or not
- ➢ To determine whether it is benign (reactive, infectious, etc.) or malignant
- ➢ If malignant, is it lymphoma or of metastatic origin

Technical consideration

To make perfect direct smears from samples of lymphoid tissue takes considerable practise. An air-dried smear has to dry quickly for optimal fixation. The smearing pressure should be well balanced to obtain a thin smear and at the same time avoid crushing artefacts.

Accuracy of diagnosis

The diagnostic sensitivity of metastatic malignancy reported in literature varies. Diagnostic specificity for malignancy is high. The reasons of false negative diagnosis are low grade lymphomas (e.g. follicular lymphoma, CLL, marginal zone lymphoma), partial involvement by a lymphoma, few RS / neoplastic cells in nodular sclerosis classical Hodgkin lymphoma, T-cell lymphoma, micro metastasis by carcinoma, melanoma&cystic degeneration (e.g. in metastatic SCC, papillary carcinoma of the thyroid).

The reasons of false positive diagnosis are infectious mononucleosis with RS-like cells, floridly reactive lymph nodes with many activated large lymphoid cells, interfollicular small T-lymphocytes sampled with a "monotonous" pattern&benign epithelial inclusions.

Salivary Gland

Usefulness of FNAC in salivary gland swellings

Incisional biopsy is completely contraindicated in major salivary gland tumours asit causesneoplastic cell implantation & also results in local recurrence. [5]

- To differentiate between neoplastic from nonneoplastic -This distinction is important, to decide between surgical or conservative treatment.
- To differentiate benign, high grade & low grade malignancy- PA & MECcreate problems in diagnosis.
- For exact tumour typing- Due to the histologic complexity, morphological variability of tumours, overlapping morphologic patterns and relative rarity of the lesions; it is difficult to acquire diagnostic expertise in FNA of salivary gland tumours.

Technical consideration

Atleast one slide should be air dried & stained by Giemsa stain. Romanowsky-type stains are superior to Papanicolaou stain for assessing stromal elements on salivary gland aspirations. These cellular & extracellular components play a very important role in diagnostics of salivary gland tumours.

Accuracy of Diagnosis

To confirm whether the lesion is arising from salivary gland or adjacent tissue is not always easy to decide. The anatomical sites can be misleading. The possibilities of salivary gland itself, intraparotid lymph node and cervical node, cyst in neck or soft tissue should be kept in mind when aspirating from the possible salivary region.The secondary changes like lymphoid stroma, cystic change, oncocytic change, clear cell change, sebaceous differentiation, mucin production also occur in the salivary gland which should be kept in mind.

Thyroid

Usefulness of FNAC in thyroid gland swellings

- In a diffuse swelling to distinguish goiter from thyroiditis
- Diagnosis of solitary thyroid nodule
- Confirmation of clinically obvious malignancy.

Technical consideration:

Thyroid aspirations should be done atleast thrice using different angles or points of entry. If quality of the samples is in doubt, immediate microscopic checking is advisable. There is emphasis on the practical utility of very thin needles in thyroid aspirations (25-gauge needles recommended). The technique needs to be modified depending on the consistency and the vascularity of the target. It is preferred to enter a thyroid nodule very gently and await the return of cyst fluid. If this does not occur, one may then initiate the usual sampling motion of the needle.[6]

Role of image guidance

Ultrasound imaging and guidance of the biopsy has been found to reduce the proportion of nondiagnostic samples. It reduces the risk of a false negative diagnosis in cystic nodules. [7]

Reporting

Reporting is based on the six tiered diagnostic classification system proposed by NCI in October 2007 which is as follows:

- **Inadequate**- Inadequate cellularity, poor fixation and preservation, obscuring blood or ultrasound gel. Repeat FNA can be recommended.
- **Benign**- This category should be followed up by clinical and periodic radiologic examination and repeat FNA if increase in the size of nodule is recommended. This category has a low risk of malignancy of <1%.
- **Indeterminate/ atypia of undetermined significance**- Includes cases where cytologic findings are not convincingly benign, yet the degree of cellular or architectural atypia is not sufficient for an interpretation of "Follicular Neoplasm" or "Suspicious for Malignancy". The Risk of malignancy is 5-10%. Benefit from repeat FNA and correlation with clinical and radiologic findings. When utilized should ideally represent <7% of all thyroid FNA interpretations.
- **Suspicious of follicular neoplasm /follicular neoplasm**: This category has low to intermediate risk of malignancy of about 20-30% (higher in Hurthle cell lesions if the nodule is equal to or larger than 3.5 cm). Lobectomy/hemi thyroidectomy is the treatment of choice.
- **Suspicious for malignancy**- Applied to the specimens that demonstrate features of a malignant neoplasm but are quantitatively or qualitatively insufficient to make a definitive diagnosis of malignancy. These features included, but were not limited to, an occasional intranuclear inclusion, nuclear grooves, or psammoma calcifications (calcospherites). This category has 50 – 70% risk of malignancy.

- **Malignant**- Thiscategory with unequivocal cytologic evidence of malignancy which includes papillary carcinoma and its variants, medullary carcinoma, anaplastic carcinoma, lymphoma&metastatic lesions.

Constantine et al[8]classified indeterminate FNAs into two subcategories.

- Cases with borderline/low cellularity with microfollicular pattern
- Cases with nuclear atypia (presence of nuclear enlargement, mild nuclear overlapping & crowding, abnormal chromatin pattern, nuclear grooves).

Thus subclassification;according to the presence or absence of nuclear atypia is an independent risk factor &may provide additional predictive value.

Soft tissues

Soft tissue can be defined as non-epithelial extra skeletal tissue of the body represented by the voluntary muscles, fat, nerve fibers, fibrous tissue& vessels. Soft tissue tumors of different types may occur in the head and neck.

Usefulness of FNAC

- It can provide a predictive diagnosis of a benign or malignant neoplasm and in many cases also of specific tumour type.
- If the diagnosis is of a benign neoplasm, surgery can be avoided in the elderly or other patients who are of poor surgical risk.
- In case of a high grade malignancy or of recurrent cancers, a cytological diagnosis allows the administration of a palliative treatment.

Accuracy of Diagnosis

Diagnosis and classification of soft tissue tumours is one of the most difficult areas in surgical pathology. The relative absence of recognizable tissue architectural pattern in cytological preparation makes diagnosis by FNAC even more difficult.

MATERIAL AND METHODS

This research study was conducted in the Department of Pathology, Surat Municipal Institute of Medical Education & Research, from November 2010 to November 2012. The patients selected were those being referred to the Cytopathology Department for head and neck FNACfrom January 2010 to September 2012. It is both a Retrospective as well as Prospective Study.

Inclusion criteria: All patients of both sexes who presented with a head or neck swelling.

Exclusion criteria: Patients who underwent FNAC but did not had subsequent histopathological examination done.

Methodology

The patients were briefly explained about the procedure and the possible outcomes. Verbal consent of all the patients was taken.

All the patients underwent:

1. Detailed history (past, clinical & family)
2. Thorough local and systemic examination
3. Otolaryngeal examination
4. Correlation with other investigations (depending on the case):

- ESR, Monteux Test, Haematological parameters
- Serum HIV, Biochemical Assay, Immunological Assay
- Chest X-Ray, Ultrasonography, Endoscopy, CT-Scan, MRI
- Tumour markers, etc.

Fine needle aspiration technique

The patients were positioned to allow the most optimal digital palpation of the mass. Taking aseptic measures, the mass was fixed. The procedure was performed by different pathologist's having varying experience with the procedure. Ultrasound guidance was used only in infrequent cases to assist the procedure of FNAC. A 5-10 ml disposable syringe with an attached needle 21-23 gauge was placed inside the mass. Suction was applied to the syringe which was maintained while multiple passes in different directions were made within the lesion. The negative pressure on the syringe was then released, and the needle was withdrawn. Care was taken that the material aspirated remains confined to the needle. The specimen was then forcibly ejected onto the glass slide. The needle was detached to introduce air in the syringe and then reattached to eject more aspirates enhanced cellular expulsion. Pressure was applied at the site of aspiration to minimize bruising and prevent any hematoma formation. Aspiration was repeated for an average of two times in each case.

Two to five slides were prepared. The aspirate was smeared with light even pressure to achieve a reasonably thin even spread. One slide was left unstained for further AFB/Pap staining in suspicious cases. One to two slides were dry fixed for Giemsa stain. The rest were wet fixed and stained with Hematoxylin and Eosin.In case of aspiration of fluid, it was centrifuged and sediment was used for preparing the slides.

Processing of tissue

All specimens were fixed in 10% formalin. Gross examination was done after complete fixation of the specimens. The cassettes were processed in a tissue processor. The slides were made &stained with haematoxylin and eosin. Ancillary techniques were applied in some cases to arrive at a definitive diagnosis. All the FNAC results were correlated with final histopathology diagnosis.

Statistical analyses

The data collected were analysed and interpretation done. Percentages were used in this study to analyse epidemiological variables.The following epidemiological variables were calculated:

Sensitivity = TP/TP+FN x 100
Specificity = TN/ TN+FP x 100
Accuracy = TP + TN/ Total No x 100
PPV (%) = TP/ TP + FP x 100
NPV (%) = TN /TN + FN x 100

OBSERVATIONS

A total of 3131 patients came for FNAC during the study period. Out of this 1919 patients had swelling in the head and neck region (61 %). From this 107(5.57 %) cases where histological correlation could be obtained were included in the study.

Table 1: Comparison of FNAcases with & without histopathological correlation

	Lymph node	Soft tissue	Thyroid	Salivary gland	Total
Cytology only	1168	308	263	80	1919
Cytohistological correlation	20 (1.7%)	38 (12%)	32 (12%)	17 (21%)	107 (5.57%)

Table 2: Organwise sex distribution

Sex	Thyroid	Lymph node	Salivary gland	Soft tissue	Total
Male	3 (9%)	12 (**60**%)	9 (53%)	21 (55%)	45(**42%**)
Female	29 (**91**%)	8 (40%)	8 (47%)	17 (45%)	62(**58%**)
Total	32	20	17	38	107

Table 3: Age Distribution

Age Range	Thyroid	Soft tissue	Lymph node	Salivary gland	Total
1-10	-	2	4	-	6(5%)
11-20	2	8	2	3	15(14%)
21-30	12	9	4	3	**28(26%)**
31-40	6	9	1	5	21(21%)
41-50	7	6	5	2	20(20%)
51-60	3	4	4	3	14(12%)
61-70	2	-	-	1	3(3%)
Total	32	38	20	17	107

Table 4: Duration of swelling

Duration	No. of cases	Percentage
< 7 Days	1	1%
>1 week	6	5.6%
>1 month	45	42%
>1 year	55	51.4%

Table 5: Organwise distribution of nonneoplastic, benign and malignant lesions

		< 20 yrs	20-50 yrs	>50yrs	Total
Thyroid	**Inflammatory/nonneoplastic**	**-**	**13**	**5**	**18**
	Benign	1	5	1	7
	Malignant	1	5	1	7
Salivary Gland	Inflammatory/nonneoplastic	2	1	2	5
	Benign	**1**	**8**	**-**	**9**
	Malignant	-	1	2	3
Soft tissue	**Inflammatory/nonneoplastic**	**7**	**14**	**3**	**24**
	Benign	3	7	1	11
	Malignant	1	2	-	3
Lymph node	**Inflammatory/nonneoplastic**	**1**	**7**	**2**	**10**
	Benign	-	-	-	0
	Malignant	**4**	**1**	**5**	**10**

Table 6: Site distribution

Head	**No.of cases**	**Neck**	**No. of cases**
Scalp	2	Cervical region	29
Cheek	6	**Midline neck region**	**33**
Below eye	1	Supraclavicular region	1
Parotid region	**13**	Submandibular region	12
Post auricular	3	Sub mental region	2
Palate	1	Nape of neck	1
Pinna	1	Suprasternal region	1
Mandibular region	1		
Total	28 **(26%)**	Total	79 **(74%)**

Table 7: Common diagnosis based on cytological results only

Cytological diagnosis	Incidence	Cytological diagnosis	Incidence
Thyroid (n=263)	**15%**	**Soft tissue (n=308)**	**17%**
Goiter	63%	Abscess	31%
Hashimotos thyroiditis	11%	Keratinous cyst	30%
Follicular lesion/neoplasm	7%	Lipoma	20%
Salivary gland (n=80)	**4%**	**Lymph node (n=1168)**	**64%**
Pleomorphic adenoma	42%	Tuberculous lymphadenitis	39%
Sialedinitis	15%	Reactive lymphadenitis	29%
MEC	4%	Metastatic SCC	6%
		Lymphoma	1%
		Poorly diff. carcinoma	1%

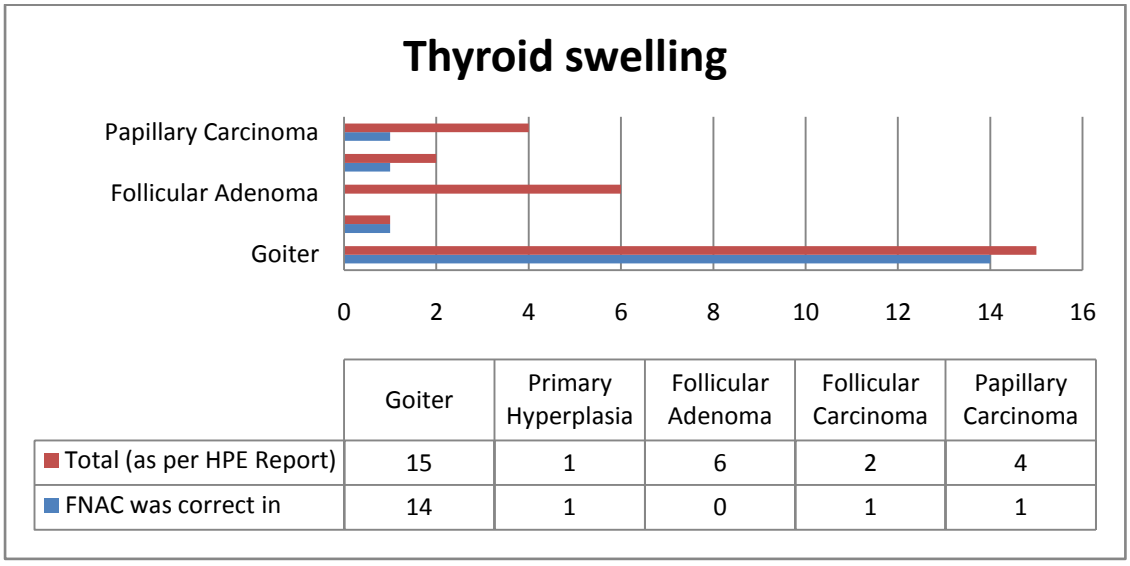
Table 8: Unsatisfactory/nondiagnostic aspirates (n=8)

Cytological diagnosis- No opinion	**Final histopathological diagnosis**
Thyroid (1)	Colloid goiter (1)
Salivary gland (2)	Sialedinitis (1)
	Multicentric pleomorphic adenoma(1)
Soft tissue (4)	Cavernous hemangioma (2)
	Descriptive (1)
	Pleomorphic sarcoma (1)
Lymph node (1)	Angiolymphoid hyperplasia with eosinophilia (1)

Table 9: Cyto-histopathological Correlation of thyroid swellings

Type specific cytological diagnosis	Corroborative H/P diagnosis	Other H/P diagnosis	
		Inflammatory/benign	Malignant
Inflammatory/nonneoplastic			
Goiter(22)	14	FA(4), FA + subacute thyroiditis (1) Hurthle cell tumor of uncertain malignant potential (1)	Papillary carcinoma(1)
Benign thyroid lesion (1)	0	_	Papillary carcinoma(1)
Thyroid cyst(1)	0	_	Encapsulated variant of papillary carcinoma (1)
Benign thyroid lesion/ follicular lesion (1)	0	Hashimoto's thyroiditis (1)	_
No opinion (1)	0	Goiter (1)	_
Hyperplasia (1)	1	_	_
Benign neoplasm			
Follicular neoplasm (2)	1	Adenomatous hyperplasia (1)	Follicular carcinoma (1)
Follicular lesion v/s nodular hyperplasia (1)	0	Follicular adenoma (1)	_
Malignant neoplasm			
Papillary carcinoma thyroid (2)	1	_	Follicular carcinoma (1)
Follicular neoplasm v/s papillary carcinoma (1)	0	_	Follicular variant of papillary carcinoma (1)

GRAPH 1: Cyto-histopathological Correlation of thyroid swellings



	Goiter	Primary Hyperplasia	Follicular Adenoma	Follicular Carcinoma	Papillary Carcinoma
Total (as per HPE Report)	15	1	6	2	4
FNAC was correct in	14	1	0	1	1

Table 10:Cyto-histopathological Correlation of salivary gland

Type specific cytological diagnosis	Corrobo-rative H/P diagnosis	Other H/P diagnosis	
		Inflammatory /benign	Malignant
Inflammatory/nonneoplastic			
Sialedinitis (1)	1	_	_
Sialedenosis (1)	0	Granulomatous sialedenitis (1)	_
Benign salivary gland lesion (1)	0	Oncocytoma (1)	_
Mucocele (1)	0	_	Low grade mucoepidermoid carcinoma (1)
Granulomatous lymphadenitis (1)	0	Normal salivary tissue (1)	_
No opinion (1)	0	Pleomorphic adenoma (1)	_
No opinion (1)	0	Sialedinitis (1)	_
Benign neoplasm			
Pleomorphic Adenoma (7)	7	_	_
Malignant neoplasm			
Low grade mucoepidermoid carcinoma (1)	0	Intraductal papilloma (1)	_
Warthin's v/s oncocytoma/Malignant salivary gland tumor (1)	0	_	High grade mucoepidermoid with oncocytic change (1)
Adenoid cystic carcinoma v/s pleomorphic adenoma (1)	0	_	Adenoid cystic carcinoma (1)

GRAPH 2: Cyto-histopathological Correlation of salivary gland

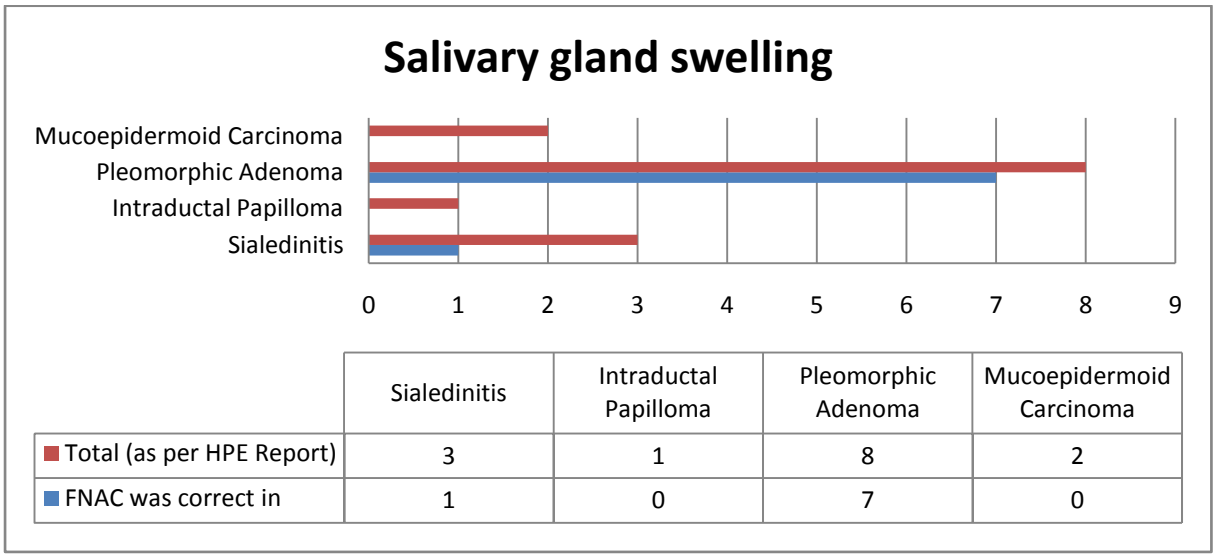


Table 11:Cyto-histopathological Correlation of soft tissue swellings

Type specific cytological diagnosis	Corrobo-rative H/P diagnosis	Other H/P diagnosis	
		Inflammatory /benign	malignant
Inflammatory/nonneoplastic			
Keratinous cyst (15)	15	_	_
Thyroglossal cyst (2)	1	Brachial cyst (1)	_
Abscess (2)	0	Descriptive (2)	_
No opinion (4)	0	Cavernous hemangioma (2) Descriptive (1)	Pleomorphic sarcoma (1)
Benign neoplasm			
Vascular lesion/ hemangioma (1)	1	_	_
Lipoma (4)	4	_	_
Cystic lesion /lymphangioma /cystic hygroma (4)	4	_	_
Benign spindle cell lesion/ schwanomma (2)	2	_	_
Benign soft tissue lesion (1)	0	Neurofibroma (1)	_
Epidermal cyst(1)	0	Sclerotic fibroma (1)	_
Malignant neoplasm			
Keratinous cyst v/s SCC (1)	0	_	Well differentiated SCC (1)
Lymphoma v/s round cell tumor (1)	_	_	Alveolar RMS (1)

GRAPH 3: Cyto-histopathological Correlation of soft tissue swellings

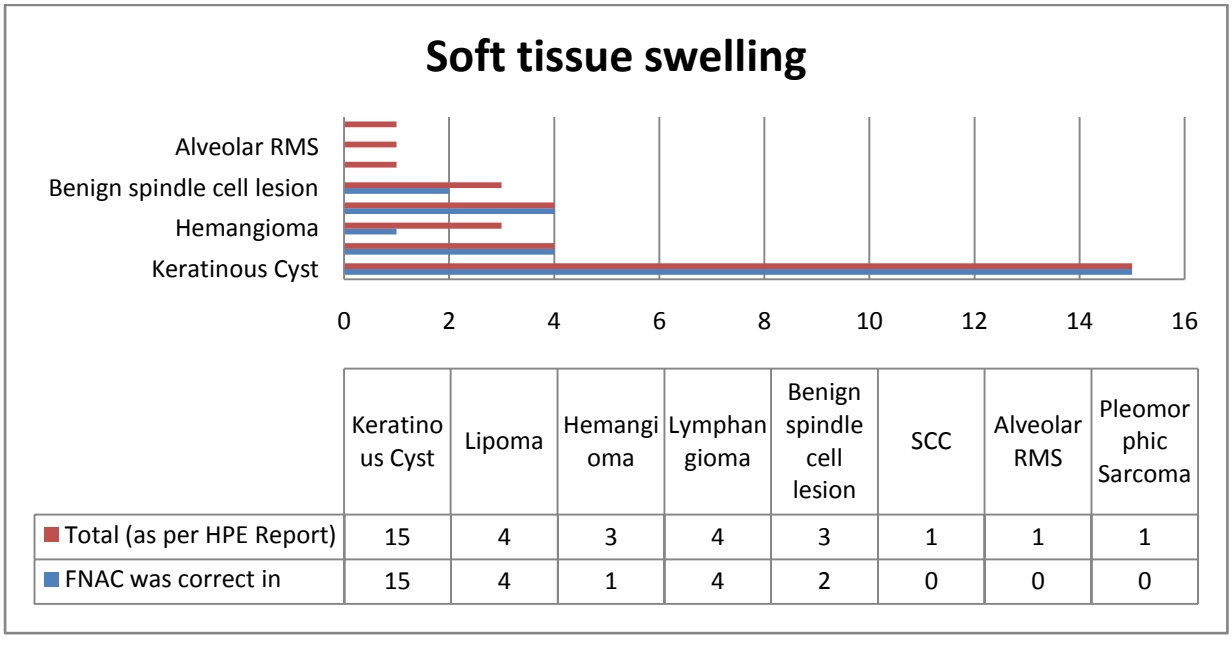


Table 12: Cyto-histopathological Correlation of lymph node swellings

Type specific cytological diagnosis	Corrobora-tive H/P diagnosis	Other H/P diagnosis	
		Inflammatory/benign	Malignant
Inflammatory/nonneoplastic			
Reactive lymphadenitis (2)	0	Castleman's disease (1) Reactive v/s castleman (1)	_
Ac.Suppurative LNs (1)	0	Descriptive (1)	_
Granulomatous LNs (4)	1	TB LNs (3)	_
Granulomatous LNs S/o koch's/ lymphoma (1)		_	Hodgkin's lymphoma (1)
Gr. lymphadenitis (1)	0	Abscess (1)	_
No opinion (1)	0	ALHE (1)	_
Microfilaria (1)	0	_	Papillary adeno-carcinoma (1)
Reactive LNsv/s HL (1)	0	Castleman's disease (1)	_
Malignant neoplasm			
Metastatic SCC (1)	1	_	_
Metastatic poorly differentiated carcinoma (1)	1	_	_
NHL (1)	1	_	_
S/o lymphoma (2)	Angioimmu. LNy (1) HL (1)	_	_
Hodgkin's lymphoma (2)	2	_	_
Chloroma (1)	_	_	Lymphoma/myel-oid sarcoma (1)

GRAPH 4: Cyto-histopathological Correlation of lymph node swellings

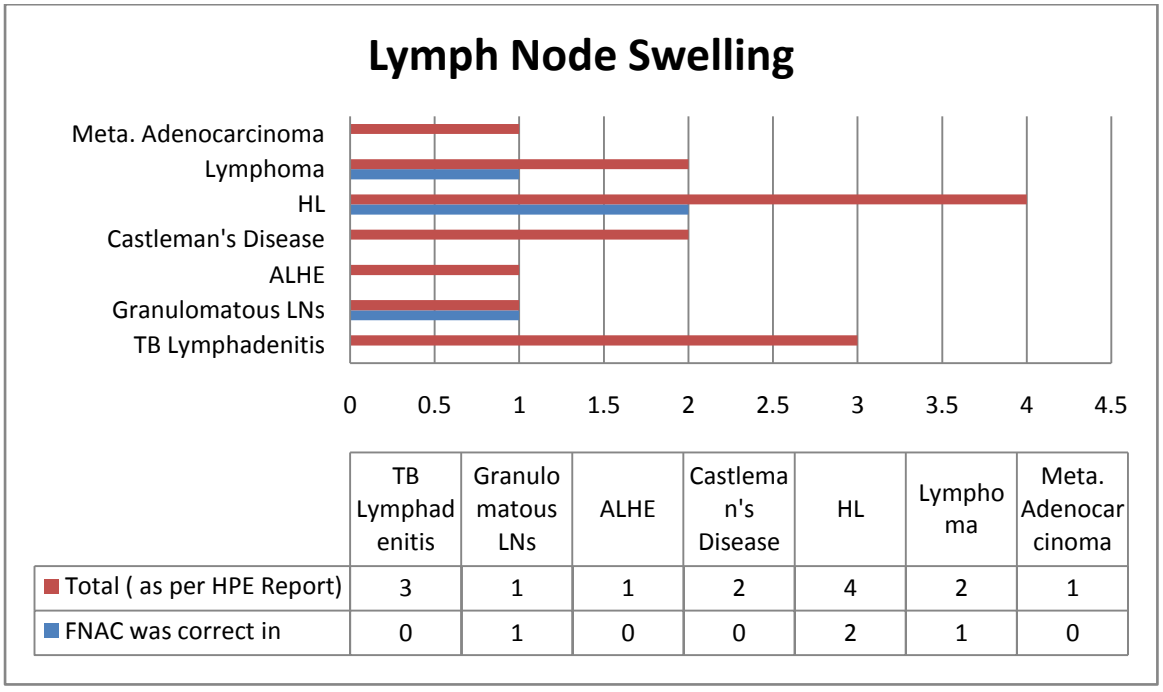


Table 13: Organ wise Statistical Analysis

Histopathology	Cytology		Total
	Malignant	Benign	
Thyroid (n=28)			
Malignant	True positive (3)	**False negative (4)**	7
Benign	**False positive (1)**	True negative (20)	21
Salivary (n=13)			
Malignant	True positive (0)	**False negative (1)**	1
Benign	**False positive (1)**	True negative (11)	12
Soft tissue(n=32)			
Malignant	True positive (0)	False negative (0)	0
Benign	False positive (0)	True negative (32)	32
Lymph node(n=17)			
Malignant	True positive (8)	**False negative (1)**	9
Benign	False positive (0)	True negative (8)	8

Table 14: Overall Statistical Analysis

Histopathology (n=90)	Cytology		Total
	Malignant	Benign	
Malignant	True Positive (11)	**False Negative (6)**	17
Benign	**False Positive (2)**	True Negative (71)	73
Total	13	77	90

Table 15: Organwise comparison of statistical data

	Sensitivity	**Specificity**	**Accuracy**	**PPV**	**NPV**
Thyroid	25%	93.75%	64.28%	75%	62.5%
Salivary	-	91.66%	84.61%	-	91.66%
Soft tissue	-	100%	100%	-	100%
Lymph node	80%	100%	84%	100%	80%
Overall	**50%**	**97%**	**85.55%**	**84.61%**	**85.71%**

Table 16: Discordancy Rate

	Discordancy Rate
Thyroid	53%
Salivary Gland	53%
Soft tissue	28.94%
Lymph Node	60%
Average	**44.85%**

DISCUSSION

Demographic Profile

Mean age of our study subjects was 35 years with minimum age of 3 months & maximum age of 61 years. The highest incidence was between 21-30 years (26 %). 58% patients were female.Male to female ratio was 1:1.3. There were 12 patients in the paediatric age group amounting to 11.21% of cases.

Site of lesion

Cervical region was involved in 74% of cases and neck region involved in 26% cases. Ratio of head to neck region swelling was 1:2.68. Parotid was the commonest region involved in head while midline was the commonest region involved in neck.

Signs and symptoms

The most common symptom was swelling. Most of the patients presented to us after a year of swelling. Only 1% presented within a week, 5.6% within a month and 42% within a year.

Aetiology

Considering cytological diagnosis only; lymph nodes swellings (64%) was the commonest and the salivary gland (4%) was least involved. The commonest cytological nonneoplastic lesion was tuberculous lymphadenitis, benign lesion was Lipoma and malignant neoplasm was metastatic squamous cell carcinoma.

Considering cases with histopathological correlation; the commonest cause of swelling was from lesion in soft tissues (38 cases amounting to 35%). Salivary gland swellings were least common in occurrence, comprising of 17(16%) cases.The incidence of nonneoplastic swelling was highest; amounting to 53% cases followed by benign neoplasm 25% and malignant neoplasm 22% cases.Goiter (15%) and keratinous cyst (14%) were the commonest diagnosis. Pleomorphic adenoma (7%) was the commonest benign neoplasm and lymphoma (7%) was the commonest malignant neoplasm.

There were 12 patients in the paediatric age group amounting to 11.21% of total cases in our study. The most common diagnosis in paediatric group was hodgkin's lymphoma (4 cases). Also mesenchymal lesions from the soft tissues of the head and neck represented common lesions that were aspirated.

The inadequacy rate was 6.5% (7 cases).Organ-wise inadequacy rate was 3%, 12%, 10.52% and 5% in thyroid, salivary, soft tissue and lymph node respectively.

Statistical results

The diagnostic accuracy of FNAC was 85.55%. Sensitivity of fine needle aspiration cytology for presence of malignancy is 50% and specificity of fine needle aspiration cytology for absence of malignancy is 97%.

The overall sensitivity of this study is very low as compared to other study. Thelow sensitivity was for thyroid lesions in this study. Also sensitivity for salivary gland and soft tissue could not be calculated due lack of true positive cases in them.

The Positive Predictive Value is 84.61 % and Negative Predictive Value is 85.71%.The diagnostic accuracy for thyroid masses was 64.28%. The diagnostic accuracy for lymph node is 84% and for salivary gland is 84.61%. The diagnostic accuracy for soft tissue was 100%.

The overall discordancy rate was 44.85%. The highest discordant cases were seen in lymph node swellings (60%) and least discordancy was seen in soft tissue swellings (28.94%). The discordancy rates of thyroid and salivary gland are 53% each.

Discordant cases

Table 17: Discordant cases- Thyroid (n= 14)

Case	Cytological Diagnosis	Definitive Histopathological diagnosis
1	Goitre(5)	FA (4) FA with subacute thyroiditis (1)
2	Goitre(1) Thyroid cyst(1) Benign thyroid lesion (1)	Papillary carcinoma (3)
3	Goitre(1)	Hurthle cell tumour of uncertain malignant potential (1)
4	Benign thyroid lesion/ follicular lesion (1)	Hashimoto's thyroiditis (1)
5	Follicular lesion v/s nodular hyperplasia (1) Follicular neoplasm (1)	Follicular adenoma (1) Adenomatous hyperplasia (1)
6	No opinion (1)	Goiter (1)
7	Papillary carcinoma (1)	Follicular carcinoma (1)

Table 18: Discordant cases - Salivary Gland (n=9)

Case	Cytological diagnosis	Histopathological diagnosis

1	Sialedenosis (1) Benign salivary gland lesion (1)	Granulomatous sialedenitis (1) oncocytoma (1)
2	Granulomatous lymphadenitis (1) No opinion (2)	Normal salivary tissue (1) Pleomorphic adenoma (1) Sialedinitis (1)
3	Low grade MEC (1)	Intraductal papilloma (1)
4	Mucocele (1)	Low grade mucoepidermoid carcinoma (1)
5	Warthin's v/s oncocytoma / Malignant salivary gland tumour (1)	High grade mucoepidermoid with oncocytic change (1)
6	ACC v/s PA (1)	ACC (1)

Table 19: Discordant cases - Lymph Node (n=10)

Case	Cytological diagnosis	Histopathological diagnosis
1	Granulomatous lymphadenitis (3)	Tuberculous lymphadenitis (3)
2	Granulomatous lymphadenitis S/o koch's / lymphoma (1)	Hodgkin's lymphoma (1)
3	Reactive lymphadenitis (1) Reactive lymphadenitis (1) Reactive lymphadenitis v/s HL (1)	Castleman's disease (1) Reactive v/s castleman's disease (1) Castleman's disease (1)
4	Granulomatous lymphadenitis with II infection (1)	Abscess
5	Microfilaria (1)	Metastatic Cystic papillary adenocarcinoma (1)
6	No opinion (1)	ALHE (1)

Table 20: Discordant cases -Soft Tissues (n= 9)

Case	Cytological diagnosis	Histopathological diagnosis
1	Abscess (2)	Descriptive (2)
2	Keratinous cyst v/s squamous cell carcinoma (1)	Well differentiated squamous cell carcinoma (1)
3	Lymphoma v/s round cell tumour (1)	Alveolar rhabdomyosarcoma (1)
4	Benign soft tissue lesion (1)	Neurofibroma (1)
5	No opinion (4)	Cavernous hemangioma (2) Descriptive (1) Pleomorphic sarcoma (1)

Conclusions

The study ‘Cytological evaluation of head and neck swellings: Its correlation with Histopathology’ was conducted between January 2010 to December 2012. Only those patients with head and neck swelling and who underwent both Fine needle aspiration and biopsy procedures were included in the study. A total of 107 cases were studied.On the basis of the above observations/ results the following conclusions could be drawn:

One major limitation of our study was its retrospective design. Patients not undergoing further biopsy/surgery were not included, so that a significant number of false-negative cases might have been missed.

Disparate entities may present with similar cytological findings in the H&N region.A detailed description of differential diagnosis should be given in the cytology report in suspicious cases.

Lastly we propose that a specialized head and neck FNAC cytology request form should be used in every case to improve the quality of the clinical information available to the reporting cytologist, and that the results should be audited prospectively. [9]

A word of caution to the aspirator would be in order that to rule out selective sampling, especially in larger or solid cystic tumors, adequate care should be taken and multipoint, multidirectional aspiration is adhered to. [10]Repeated aspirations from different sites of the lesion may reduce the false-negative rate.

Nearer vertical approach reduces pain and allows better appreciation of depth.Only 1-2cc of suction via a 10 ml syringe is required to provide adequate tissue. There is a tendency to increase the size of the needle to obtain material, but it is better to decrease the diameter of the needle, as there is greater chance that the sharp tip will penetrate the capsule.

Cell blocks can be very useful and are suitable for all histochemical and immunohistochemical special stains. The method of cell block preparation involves allowing haemorrhagic material to clot. This is then placed in neutral buffered formalin and handled as any small histologic specimen.

The low type specific diagnosis in benign lesions attests to the plethora of lesions with much overlap in cellular and background material yield. Though every endeavour should be to diagnose tumor subtype, in our view this can be attained only when the interpreter's experience in the evaluation of smears from the head and neck region increases.

When evaluating a test for its ability to identify patients with malignancy, the sensitivity is more important than the specificity, since a false negative report may encourage delay in further investigation or treatment. Needle biopsy has

low sensitivity both in our study and in almost all published reports. Therefore clinical suspicion must always take precedence. [11]

Early surgical biopsyshould be considered in rapidly enlarging masses, in the presence of persistent systemic symptoms and when repeated FNA cytology is non-diagnostic.

Thyroid

One of the major observations of our study; made in thyroid aspirations is very low sensitivity. This is due to under reporting of follicular lesions/neoplasms. The other reasons behind low sensitivity are reporting done on inadequate smears, high vascularity leading to heavily blood mixed aspirates and frequent cystic change leading to sparsely cellular smears. My recommendations are to increase the level of expertise in skill of thyroid aspirations, routinely adopting USG guided thyroid FNAC's and use of finer gauge needles particularly for thyroid aspirations.

Dual pathologies are common in thyroid gland. So the same should be kept in mind & multiple aspirations should be a routine. Smears of thyroid aspirations demand thorough screening.

It is recommended to avoid giving definitive diagnosis on sparsely cellular & poor quality smears. FNAC should always be repeated before performing thyroidectomy.

Smears falling in the category of Indeterminate/atypia of undetermined significance should be sub classified based on those showing nuclear abnormalities (enlargement, overlapping, grooves, crowding, and chromatin clumping) & those having microfollicular areas. Some thyroid carcinomas may have macrofollicular areas. Cytologic criteria alone cannot reliably distinguish follicular lesion from nodular hyperplasia because of considerable overlap of features.

For a young male patient with solitary nodule and inadequate material on repeated aspiration; close follow up is warranted.

Neoplasms that are undetected by cytology are more disturbing, since patients might not be advised to undergo thyroidectomy if cytological findings are used as the sole indication for operation. When other clinical parameters are suggestive of malignancy, a negative aspiration should never preclude surgical exploration of the thyroid. [12]

Salivary gland

Romanowsky type of stain is a must for FNA of salivary gland lesions. [13]

The possibilities of salivary gland, intra-parotid lymph node, cervical node, cyst in neck& soft tissue mass should be kept in mind when aspirating from the possible salivary region.Plethora of secondary changes like lymphoid stroma, cystic change, oncocytic change, clear cell change, sebaceous differentiation, mucin production should be kept in mind while arriving at a diagnosis.

Patients with sialolithiasis are usually adult female with submandibular swelling with classical history of pain during meal times. Also presence of stone fragments in aspirate and ciliated metaplasia favour lithiasis over low grade MEC.

For differentiating PA from ACC with overlapping features cellular morphology should be studied; nuclear chromatin pattern and stripped nuclei should be looked for. Most important feature is the presence of plasmacytoid myoepithelial cells in PA.

Salivary gland aspirates are prone to high false negative rate. It is suggested to perform parotidectomy or repeat aspiration if clinically suspected for malignancy.

Lymph Nodes

In patients with multiple LN enlargements having inconclusive cytological report; it is feasible to repeat FNA from other enlarged nodes before proceeding to open biopsy.

ZN staining is a must in suspectedcases of lymph node aspirates. If adequate aspirate is not available slides can be decolourized and then used for AFB staining. AFB is commonly found in purulent aspirates in areas of microscopic degeneration, in & within epitheloid cell granulomas. Few unstained slides of cases showing AFB positivity should be preserved and used as control for subsequent cases.

In smears showing only granulomas, cells should be carefully studied for their relative proportion & morphological detail to rule out the possibility of lymphoma. Presence of atypical mononuclear cells along with granuloma should raise high index of suspicion for further evaluation.

It is important for the pathologist and the clinicians to be aware that negative FNA results do not exclude lymphoma in patients with unexplained lymph node enlargement. Repeat FNA/ biopsy should be considered.

Castleman’s disease should be kept as a differential diagnosis of localized/multicentric lymphadenopathy especially in an asymptomatic & young patient; features like hyalinised capillaries, large atypical cells & germinal centre cells with eosinophilic material should be looked for.

Soft tissue

Problem frequently arises in differential diagnosis of benign squamous lined cyst & SCC. It is recommended that in absence of clear cut cytologic evidence of malignancy; consider excision of any squamous lined cyst in any patient other than young child.

To conclude this study is a sincere attempt to find the level of cytohistologic concordance, critically evaluate the discrepant cases and possible methods in which it could be minimized. The result is; strict adherence to adequacy criterion and meticulous examination of all the smears are of paramount importance in reducing the discrepant cases.

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